Claims

1. An HCV vaccine comprising a polynucleotide that encodes the polypeptide sequences of the HCV proteins: core, NS3, NS4B and NS5B, for use in medicine.

2. An HCV vaccine as claimed in claim 1, wherein the polynucleotide encodes no other HCV protein.

3. An HCV vaccine as claimed in claim 1 or claim 2, wherein polynucleotide encodes a core protein which is truncated from the carboxy terminal end in a sufficient amount to reduce the inhibitory effect of Core upon the expression of other HCV proteins

4. An HCV vaccine as claimed in 3 wherein the truncated core protein has a deletion of at least the C-terminal 10 amino acids.

5. An HCV vaccine as claimed in claim 4 wherein the truncated core protein consists of the Core 1-151 sequence.

6. An HCV vaccine as claimed in claim 1 , wherein the HCV proteins are present in the form of a fusion protein containing one or more of the HCV proteins.

7. An HCV vaccine as claimed in claim 6, wherein the fusion protein is a double fusion consisting of the polypeptide sequences of NS4B and NS5B.

8. An HCV vaccine as claimed in claim 6, wherein the fusion protein is a double fusion consisting of the polypeptide sequences of NS3 and Core

9. An HCV vaccine as claimed in claim 1, wherein the HCV proteins are encoded by the polynucleotide in more than one expression cassettes.

10. An HCV vaccine as claimed in claim 9, wherein the expression cassette encoding the Core protein is in a cis location downstream of the expression cassette which encodes at least on of the other HCV proteins.

11. An HCV vaccine as claimed in claim 10 wherein the expression cassette encoding the Core protein is downstream of an expression cassette which encodes the NS5B protein.

12. An HCV vaccine as claimed in claim 1, wherein at least one of the HCV proteins present are inactivated by mutation.

13. An HCV vaccine as claimed in claim 12, wherein the polynucleotide encodes a NS5B protein that comprises a mutation in motif A.

14. An HCV vaccine as claimed in claim 12, wherein the polynucleotide encodes a NS3 protein wherein the protease activity has been abrogated by mutation in any of the catalytic triad amino acids.

15. An HCV vaccine as claimed in claim 12, wherein the polynucleotide encodes a NS3 protein wherein the helicase activity has been abrogated by mutation in one or more of the helicase motifs I, II, III or IV.

16. An HCV vaccine as claimed in claim 12, wherein the polynucleotide encodes a NS4B protein comprising a truncation to remove the highly variable N-terminal region.

17. An HCV vaccine as claimed in any on of claims 1 to 16 wherein the polynucleotide vaccine encodes any one of the HCV combinations 1 to 19.

18. An HCV vaccine as claimed in claim 1, wherein the polynucleotide is a DNA sequence.

19. An HCV vaccine as claimed in claim 18 wherein the DNA sequence is in the form of a plasmid.

20. A vaccine as claimed in any one of claims 1 to 17 wherein the oligonucleotides are codon optimised for expression in mammalian cells.

21. A method of preventing or treating an HCV infection in a mammal comprising administering a vaccine as claimed in any one of claims 1 to 17 to a mammal.

22. A method of vaccination of an individual comprising taking a polynucleotide vaccine as claimed in any one of claims 1 to 17, coating the polynucleotide onto gold beads and delivering the gold beads into the skin.

23. Use of an HCV vaccine as claimed in any one of claims 1 to 17 in the manufacture of a medicament for the treatment of HCV.